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ABSTRACT

Public schools are in a position to convince society-at-large of the national energy problem. There is a direct relationship between energy costs to the schools and the type of educational programs they can provide. While waiting for a national energy policy with a section devoted to schools, districts can calculate the amount and cost of energy per pupil by utilizing utilities' records, enrollment and attendance figures, and building measurements. A number of energy-saving techniques are outlined. A model of a districtwide energy conservation plan is presented. Appendixes contain a bibliography and examples of procedures followed in the plan. (Author/MLP)

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A MODEL FOR EDUCATION:

ENERGY-WATER CONSUMPTION

DECISION MAKING

Ralph L. Bontrager
Charles W. Hubbard

February 1977

EA 009 161

TABLE OF CONTENTS

FOREWORD 1

ENERGY - A SCHOOL PROBLEM 1

BIBLIOGRAPHY 11

EPILOGUE 14

APPENDIX A 16

Conservation Team

APPENDIX B 17

Building Energy Audit -- CPP

APPENDIX C 21

Energy Check List

FOREWORD

Energy for a strong America has its implications for education, one of America's largest investments. At home, in the school districts, parishes, college and university areas of influence, boards of education, trustees and regents has a right to ask their executive officers for intelligently constructed alternatives for consideration in policy and decision making regarding energy-water resources and consumption. Actual facts need be compiled. No executive has the right to reply that there was no time to devote to considerate planning.

Temptation daily exists for educational executives to use their time attending meetings simply because their competitor-counterparts may be present. A further temptation prevails to hold many staff meetings and workshops for no other reason than it is the thing to do, without an objective to create change for improvement of the educational process. Gaining soft money occupies the minds of many educational executives. Soft money may be in the form of federal grants or local tax funds, depending upon the impulse of the executive. All this serves to divert time, that precious item of our lives, to efforts that do not affect the welfare of our clients, the students.

Studies of the consumption of energy-water in our facilities have important bearing upon today and the future. Stand-by energy units are deceptively short lived. Water sources are regarded by omniscient executives as being omnipresent ubiquitous concomitants of living. The real facts present a far different picture. Meaningless answers to queries on energy consumption and water supplies only reflect the misplaced activities of school executives. Knowledge of cost-benefit-survival participation and planning for energy-water is reflected in only embrionic stages in most school units.

Data on this matter exist in every school district, parish and area of influence center. Cost of gas, electricity and water is reflected in the utilities section of budgets. Bills for these items are paid monthly and recorded by bookkeepers. Enrollment figures are collected with accuracy each fall. Information on the square-foot area of each structure maybe more deeply hidden but obviously can readily be obtained. Attendance figures for each structure may also be derived from the records. Buildings serving the entire district utilize entire district enrollments as divisors. Consistent use of the model presented by Mr. Hubbard in the following pages make preparation for informed discussion and solution to questions which arise. The Epilogue posts some questions which board members and trustees are likely to ask in energy-water-use-meetings across America.

Well founded answers reside in the available data. After the first rash of emotion-based questions, all participants will be haunted by the long term question: How shall we discipline ourselves, provide intelligent planning and avoid a plundered area for ourselves and our posterity?

ENERGY - A SCHOOL PROBLEM

"The energy situation in our nation is graver than anyone yet sees and school districts are going to have to take the lead in doing something about it".[1] So spoke Edward Stephan, Deputy Director of the Office of Energy Programs in the United States Department of Commerce at one of the session meetings at the annual convention of the Association of School Business Officials of the United States and Canada in Boston in October. The fact that the energy situation in our nation is serious, is nothing new to those individuals in the schools who are paying the bills. That is why energy and energy problems have been discussed at the last several national meetings of the school business officials. Even though the general public does not as yet appreciate what is happening energy-wise, school administrators have been aware of the problem for many years through their professional literature, because energy usage and conservation has become one of the most important topics.

The energy crisis in late 1973 and early 1974 made organization of governmental administrative agencies imperative. So by Executive order on December 4, 1973, the Federal Energy Office was created to deal with the energy problem and the following May, the Federal Energy Administration Act created a sucessor agency, the Federal Energy Administration, to carry out functions related to short term fuel shortages. Although the proposal for a comprehensive cabinet-level agency for natural resources

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[1] Stephan, Edward, "Energy-A Grave Situation", ASBO Annual Meeting Reporter, October 6, 1976, p.1.

and energy had the backing of Senator Henry M. Jackson, the Senate's leading spokesman on energy and other influencial members of Congress, it ran into political obstacles there.

There has been growing recognition of the need for more clearly defined national policies for all resource fields, but particularly for energy resources. Responsibilities have been so widely dispersed on matters relating to natural resources, that the shaping of integrated policies will not be easily or quickly accomplished. In the past, efforts to integrate policy on energy have tended to reflect a least common-denominator approach and have demonstrated that even when a consensus can be reached on the definition of an important policy question, there is little likelihood of unanimity on appropriate reactions to the problem. An oil shortage, for example, could prompt one group to call for more imports; another for curtailed imports to increase domestic investment in petroleum exploration. A third group might propose a massive technological attack to produce synthetic oil. A fourth, might urge reduced consumption. Indeed, all these ideas surfaced in response to the 1973-74 energy crisis. It is quite apparent that the breadth and range of problems in the making of a resource policy are of such magnitude that it will likely take a long time to work out comprehensive and integrated policies.[2]

In response to this problem and especially as it affects school districts across the nation, Senator Edward Kennedy, Democrat from Massachusetts, introduced a bill in the last session. In its final form, the legislation provides guaranteed loans for improving buildings.

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[2] White, Eston T. and Phillip A. Gallo, Natural and Energy Resources, Industrial College of the Armed Forces, Washington, D.C., 1974, pp. 12-13.

"Schools are one of the worst offenders in using energy, therefore, they are the most able to successfully conserve."[3] With these available loans, school districts can do some of the needed work toward conserving energy in their school plants.

However, Paul Abramson, an independent consultant, hired by the Federal Energy Administration, to conduct a survey in the nations schools on energy and its impact on the educational field, feels that the Kennedy legislation is not adequate. In the private sector, the increased cost of energy can be passed on to the consumer by adding it to the cost of its services or products, or it can be taken off the company's tax ststement as an expense. Even the cost of the investments to "energize" its buildings can be written off as a depreciated item. None of these alternatives are available to the nation's schools.[4] So there must be some method whereby, the federal government, hopefully the 95th Congress, will pass a national energy policy with a section devoted to schools.

Mr. Stephan, who chaired the Super Session on Energy at the 1976 ASBO Convention, feels the government should do as much for the schools as it does for the private sector. If it gives a tax break of 10% in investment credit on money spent on energy-saving equipment and buildings, why not develop a parity program on energy expenditures in the schools? The districts would pay a basic amount for energy and the money spent above that would be returned to the districts on a direct grant basis.[5]

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[3] Kennedy, Edward M., "Keynote Address-Second General Session", ASBO Convention, Boston, Massachusetts, October 5, 1976.

[4] Abramson, Paul, "Energy Report", ASBO Convention, Boston, Massachusetts, October 6, 1976.

[5] Stephan, Edward, "Super Session, Energy", ASBO Convention, Boston, Massachusetts, October 4, 1976.

In the meantine, while waiting for a more concerted national effort, local school finance people are realizing that the high cost of energy is not going to disappear and that they must be the ones to take action now. It is, indeed, a very challenging professional problem.

Energy management is an economic and ecological necessity, not only nationwide, but also in each community. It is the public schools' exposure in each one of these communities, that places it in a position to convince society at large of the national energy problem. America's schools house nearly 25% of the nation's total population on any given school day. American schools consume 11% of our nation's space-heating and cooling energy. School buses consume 500 million gallons of gasoline per year and 18 million gallons of gasoline are consumed in driver training programs. In one way or another, the use of energy in the schools touches the life of every citizen. In many states, the public school system is the largest single employer, manages the largest food service operation, operates the largest transportation system and houses the largest number of people on a day-to-day basis of any single institution. That is why Calvin E. Anderson, project director, Interstate Energy Conservation Leadership Project, Colorado Department of Education, writing in the Phi Delta Kappan says, "---there is a direct and corrosive relationship between dollar energy costs to the schools and the type of educational programs they can provide. It is only a matter of time before the inflationary costs of energy will begin to eat into the quality of our educational curricula and into the teacher's paycheck."[6]

What can school budget officers do to help cut down on energy costs

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[6] Anderson, Calvin E., "The Impact of the Energy Crisis on School Finance", Phi Delta Kappan, November, 1975, p. 194.

or at least, slow the rate of increase?

Some of the features suggested by Mr. Anderson in the previously mentioned article are:

1. To encourage your district to initiate a comprehensive energy audit.
2. Encourage the hiring of competent maintenance personnel.
3. Support efforts to promote energy conservation training programs and workshops for maintenance personnel.
4. Encourage the purchase of energy-efficient equipment and modify existing equipment and buildings for immediate energy conservation.
5. Encourage the review and possible revision of existing building codes, at the state level, to make them more energy efficient.[7]

Several professional journals have monthly articles on plant maintenance and energy conservation. The American School and University is one such magazine. Mr. John C. Gardner in the July, 1974, issue gave some very valuable ways to stretch your utilities budget in an article of the same title. He suggests in buildings with air conditioners to operate them only when absolutely necessary, with the thermostats at higher than usual settings. Don't air condition unused rooms. Frequently check automatic controls. Keep air filters clean and put fans on timers and use outside air for cooling when the outside temperature is 60 degrees or below. His suggestions for lighting are very practical ones also and can be incorporated into any school operations. Again, it is a matter of keeping fixtures clean, reducing lighting in storage areas, hallways and rest rooms, as well as investigating the possibility of a reduction of foot candles in other lighting areas.

In addition, he suggests that energy-saving techniques be a topic at every staff meeting and that monthly reports of electricity, gas and

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[7] Ibid, pp. 193-196.

fuel oil consumption be made part of a regular, school-wide bulletin.[8]

This is one way to make those of the American public who are school employees aware of the country's wasteful energy habits. For example, "Americans still use 5 times more energy per capita than any other people in the world. The energy wasted by 205 million Americans equals the total energy used by 105 million Japanese", writes George Badner in the Pennsylvania School Journal.[9]

Can these facts and the others previously stated be made relevant not only to school employees but the students as well? They can, if teachers are encouraged to incorporate energy conservation into the curriculum. One such school in Champaign, Illinois, did just that. Centennial High School added a two-semester course in environmental science in which world energy problems were studied as well as environmental, economical and social ramifications. Teacher Paul Kohler used a computerized simulator to help students realize that petroleum is crucial to the existence of our civilization. It is the raw material for a number of critical industries as well as an energy source. The simulator's display panel showed them how much energy they were drawing from the world's pool of chemical and electrical energy. It also displayed the effect of their decisions on the environmental factors, including population growth and air, radiation and water pollution.[10] But educators need not wait until high school to use such classroom

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[8] Gardner, John C., "Ways To Stretch Your Utilities Budget", American Schools and Universities, July, 1974, pp.10 and 11.

[9] Badner, Geroge, "What's Happening in Energy Crisis", Pennsylvania School Journal, May, 1975, p. 162.

[10] _____, "Time's Up, the World's Dead", Nation's Schools and Colleges, May, 1975, p. 45.

activities as meter reading, studying the benefits of insulation, energy debates and a school wide "energy-free" day---no clocks, no bells, no intercoms, no hot lunches, no A-V equipment---to impress now the citizens of tomorrow.[11]

Other suggestions for energy conservation offered in recent publications have been numerous. Setting back temperatures immediately after the building is vacated, shutting off exhaust fans plus the increasing of insulation in walls and roofs wherever feasible, are all attempts to control the major sources of heat loss: through walls, windows and roofs. Reducing glass areas is an especially important area also. This will decrease cooling energy requirements more than heating, but installing a plastic cementitious surface panel with insulation, then plywood and finally corkboard for the interior surface, amounts to $5.00 per square foot of the existing glass areas which were removed, but the savings in energy expense will pay for it in four years plus the added savings feature from then on. In schools where glassed areas cannot be removed, adding another plate of glass is recommended. This double glazing reduces heating energy more than cooling.[12]

The replacement window has become in recent years another method of eliminating the escape of warm or cool air. Most of the various commercial sources make the windows out of aluminum, bonded in a dark color which will not chip, crack, peel or blister. Installation is quick, safe and easy. The old window and surrounding wood is removed and the new window is custom-made adjustable so it can fit the specific space.

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[11] Glickman, L. Jane, "Teaching Guide on Energy", American Education, June, 1975, p. 40.

[12] Stephan, Edward, "Energy: What's Ahead?", American Schools and Universities, September, 1975, pp. 31-32, 34, 36.

Installation is done from inside the building. The older school buildings also look more attractive with these windows since they complement any type of architecture.*

Most of the suggestions made so far have been in the area of the "quick fix". They are all items that are easily attainable at negligible cost. Mostly non-technical, they emphasize the human element in energy conservation. According to existing surveys they can reduce energy consumption by 10%. The next phase would involve more detail. Added expenditures of money for modification of heating, cooling, lighting systems and extensive building repairs, etc. might well be called the "refit" section. With a capital investment of .25¢ - $1.20 per gross square foot, an expected 20-25% consumption reduction (including "quick fix" 10%) can be expected. A number of schools have entered the "refit" phase using modest amounts of self-generated capital funds. A shortage of available capital funds has usually hampered this phase. The third area is a complete "systems convert". This is more sophisticated and requires expenditures for engineering studies as well as the cost of the new system. In heating, it might be a central computerized monitoring system or a waste heat recovery system, or the conversion to a solar energy system. It may mean rewiring major electrical systems to minimize demand changes and avoid establishing new peaks, or the conversion from incandescent to fluorescent lighting. In this phase the level of expenditure is usually $1.20 - $3.00 per gross square foot but will lead to a total of 30-40% consumption reduction(including savings in the other phases). The typical pay-off will range from 5-10 years.*[13]

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* see enclosed brochures

[13] Stephan, pp. 31,32,34,36.

In the planning stage this seems very simple, but there are some real and basic obstacles to carrying out energy conservation. The prime reason is the lack of money. Since most school budgets only have 15% of the total budget left after teachers' salaries, there isn't even the small amount available for an energy systems overhaul. Other obstacles include the age or configuration of the building and the existing control systems.[14]

Now we are paying a big price for schools built cheaply with no thought of energy conservation in the 1950's and 60's. This is the result when a low first cost is the only conern in school construction, therefore, those school administrator who are fortunate enough to be planning for new schools, need to be aware of the fact that new ideas are available for energy-saving schools, but the initial cost will be high. For example, in Reston, Virginia, an elementary school was constructed in 1975 which is covered with 2 or 3 feet of earth for natural insulation. It combined a solar energy system and heat recovery system to reduce the annual operating cost of heating, cooling and supplying hot water to 30% of the cost of conventional fossil fuel. Even though, the total cost was not revealed, it is a very practical fact, that energy-saving buildings are expensive.[15]

One would not want to conclude this part of this paper on a negative note. There is no doubt about the great concerns in the school energy field, but where there is a problem, there is also a challenge. It is not an insurmountable problem, especially if all those working in the schools accept the challenge and strive together toward a solution.

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[14] Abramson, October 6, 1976.

[15] _____, "School Designed To Use 80% Less Energy", American Schools and Universities, December, 1975, pp. 47-49.

One of the objectives of this study and this paper, is the formation of a district-wide plan for energy conservation for the Derby Public Schools. Keeping in mind that a successful program, is one that is shared by all of those involved, the following steps will be followed:

1. The formation of a district-wide energy conservation team consisting of the assistant superintendent in charge of operations, the maintenance supervisor, and the head custodian and principal of each building, will begin the program. (Appendix A)

2. The recording of energy use patterns--an energy audit--for each building for the past four years gives important base line figures. (Appendix B)

3. A thorough inspection and data collection program by the team for each building is next. This will include the notation of detailed information relating to any type of energy usage with the use of the check-list as a guide. (Appendix C)

4. An evaluation of (1) collected data, (2) energy audit and (3) other pertinent information, shall follow. This step will involve many meetings and much discussion before any type of action is formulated. The end result will be the setting of some basic guidelines and goals and the establishing of time frames for their achievement. The goals will be divided into immediate and long-range with assignment of specific responsibilities to certain individuals.

5. Publicity, through system-wide bulletins and progress reports to the Board of Education, administrative staff, teachers and students, will inform everyone of the energy conservation steps in their district. With the team leading the way, hopefully, all those in the Derby Schools will work toward this common goal.

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EPILOGUE

In spite of the fact that many administrators in our public schools practice crisis-oriented management, there do exist some who direct their leadership with long range planning. Techniques involved in this planned approach deserve attention. The relatively simple recording of past experience in energy consumption leaves the investigator incredulous upon hearing colleagues protest "we have no time available", or, "our staff is too overburdened to attend to such detail."

Total expenditure for gas, electricity and water in a school system belong in every school budget. Enrollment facts are a part of every school system's reports and must be accurate for state reimbursements. Dividing the first by the latter give any thoughtful person a cost per pupil record as well as (1) a possibility of comparison with other school studies of utilities consumption, (2) providing a base for local board of education policy making, (3) comprising the content of long range planning for the school system, (4) concentrating upon expensive and/or economical utilities use in component school buildings and (5) moving to rectify energy-wasteful practices or repairs needed to correct building inadequacies and to plan preventive maintenance.

School districts throughout the entire United States of America should be viewing the energy-water crisis as demanding long range planning by school executives and school boards. Research indicates that a few states and state departments have computerized data available on some facets of energy consumption. Surveys seem to indicate that most school executives have not taken time to study this problem with appropriate facts assembled. While this situation may be easy to understand by all practitioners of the profession; it leaves an untapped bank of data available to supply alternative answers to serious, almost unanswerable questions.

The inquiries have only begun. Board members, trustees, constituents, taxpayers, teachers, students will all have questions to add to the list below. Why are taxes rising while enrollments are falling? Why is the temperature high in one room and low in another? Who sets the thermostats? Why have utility bills more than doubled? Where are the plans for coping with very cold weather? Will the schools be closed next winter? Why not close the most expensive buildings during frigid weather? Which are the most expensive buildings? Why don't we have school later in the spring? Why close the school buildings during summer? Where are the plans for 240 days of school with breaks to avoid temperature extremes? Who owns these school buildings?

The data are available. Long range plans carefully monitored, reviewed and updated will do much to assist education as those plans are put into action. Industrial firms have much to offer in the correction and modernization of facilities. It may seem costly to move in the direction of energy--water conservation but this continued investment in human resources constitutes a mainstay in our democracy. Exercise of genuine morality in this conservation, self discipline and intelligently planned use of facilities will help us avoid plundered areas for our posterity.

Appendix A

ENERGY CONSERVATION TEAM

Assistant Superintendent in Charge of Operations	- Charles W. Hubbard
Maintenance Supervisor	- Ted Sinclair
BOE and Maintenance Head Custodian	- Harold Brevik
Carlton Junior High School	
Principal	- Tom Hughes
Head Custodian	- Ed Monroe
Cooper Elementary School	
Principal	- John Stephenson
Head Custodian	- Pete Anderson
Derby Junior High School	
Principal	- V.A. Honeycutt
Head Custodian	- Les Lambertus
Derby Senior High School	
Principal	- Jack Larson
Head Custodian	- Melvin Farber
El Paso Elementary School	
Principal	- Don Crowell
Head Custodian	- Merlin Tibbetts
Oaklawn Elementary School	
Principal	- Oren Ison
Head Custodian	- Ronnie Crum
Pleasantview Elementary School	
Principal	- Ver Jyn Underwood
Head Custodian	- Warren Hysom
Swaney Elementary School	
Principal	- Bob Green
Head Custodian	- Bob Unkel
Wineteer Elementary School	
Principal	- John Brewster
Head Custodian	- Mike Gentile

APPENDIX B

BUILDING ENERGY AUDIT - GAS (1 of 3)

	1972-73	1973-74	1974-75	1975-76
BOE	304.55÷5507=$.06	115.32÷5294=$.02	408.45÷5203=$.08	392.50÷5208=$.07
Maintenance	--	715.67÷5294=$.13	866.39÷5203=$.17	828.95÷5208=$.16
Carlton Jr. High	2664.00÷654=$4.07	2243.86÷587=$3.82	3283.67÷511=$6.42	3339.07÷466=$7.17
Cooper Elem.	2283.60÷430=$5.31	1223.21÷444=$2.75	2495.69÷384=$6.49	1719.41÷398=$4.49
Derby Jr. High	3280.81÷895=$3.66	3549.55÷863=$4.11	3408.62÷863=$3.95	2054.23÷860=$2.39
Derby Sr. High	8167.60÷1304=$6.26	5515.98÷1311=$4.21	9021.29÷1303=$6.92	9369.39÷1304=$7.18
El Paso Elem.	711.87÷251=$2.83	902.45÷488=$1.84	1303.60÷524=$2.49	1149.32÷492=$2.34
Oaklawn Elem.	2211.66÷470=$4.70	1723.71÷423=$4.07	2687.67÷335=$8.02	2680.47÷369=$7.26
Pleasantview Elem.	1858.78÷511=$3.64	1486.54÷519=$2.86	2015.83÷435=$4.63	1751.19÷374=$4.68
Swaney Elem.	1651.88÷356=$4.64	808.06÷400=$2.02	2026.25÷370=$5.48	1845.17÷386=$4.80
Wineteer Elem.	1243.78÷509=$2.52	1362.53÷472=$2.89	1763.00÷569=$3.10	1731.84÷532=$3.25
TOTAL*	23048.45÷5507=$4.19	20718.58÷5294=$3.91	29318.22÷5203=$5.63	28801.00÷5208=$5.53

*These figures depict the total cash outlay for the years enumerated, not necessarily the sum of the column.

APPENDIX B

BUILDING ENERGY AUDIT - ELECTRICITY (2 of 3)

	1972-73	1973-74	1974-75	1975-76
BOE	1939.07÷5507=$.35	1576.40÷5294=$.30	2048.11÷5203=$.39	2217.12÷5208=$.42
Maintenance.	--	1932.82÷5294=$.36	2481.79÷5203=$.48	2439.46÷5208=$.46
Carlton Jr. High	6332.60÷654=$9.68	6685.22÷587=$11.39	9119.18÷511=$17.84	10009.47÷466=$21.48
Cooper Elem.	3533.54÷430=$8.22	2448.63÷444=$5.51	4040.70÷384=$10.52	5646.56÷398=$14.19
Derby Jr. High	5610.58÷895=$6.27	5544.51÷863=$6.42	11588.83÷863=$13.43	10313.74÷860=$11.99
Derby Sr. High	18632.57÷1304=$14.29	17086.42÷1311=$13.03	28972.32÷1303=$22.24	33382.32÷1304=$25.60
El Paso Elem.	2940.44÷251=$11.71	6396.91÷488=$13.11	9727.71÷524=$18.56	9238.51÷492=$18.78
Oaklawn Elem.	3668.09÷470=$7.80	3118.03÷423=$7.37	3975.29÷335=$11.87	5267.31÷369=$14.27
Pleasantview Elem.	3442.07÷511=$6.74	2875.84÷519=$5.54	3853.86÷435=$8.86	4158.59÷374=$11.12
Swaney Elem.	2507.57÷356=$7.04	2422.49÷400=$6.06	2972.95÷370=$8.04	3663.02÷386=$9.49
Wineteer Elem.	4198.89÷509=$8.25	3000.24÷472=$6.36	5522.64÷569=$9.70	5598.21÷532=$10.52
TOTAL*#	62751.55÷5507=$11.39	60571.23÷5294=$11.44	86565.06÷5203=$16.63	92427.69÷5208=$17.74

*These figures depict the total cash outlay for the years enumerated.

#These totals are the costs (actual) for the entire district and reflect all electricity costs for the year indicated, not the sum of the column.

APPENDIX B

BUILDING ENERGY AUDIT - WATER USAGE (3 of 3)

	1972-73	1973-74	1974-75	1975-76
BOE	73.53÷5507=$.01	71.27÷5294=$.01	59.88÷5203=$.01	55.49÷5208=$.01
Maintenance	122.56÷5507=$.02	134.32÷5294=$.02	146.67÷5203=$.03	145.12÷5208=$.03
Carlton Jr. High	873.94÷654=$1.34	749.64÷587=$1.28	649.08÷511=$1.27	794.39÷466=$1.70
Cooper Elem.	515.70÷430=$1.20	587.52÷444=$1.32	1114.98÷384=$2.90	1382.29÷398=$3.47
Derby Jr. High	2259.74÷895=$2.52	2013.23÷863=$1.54	1831.29÷863=$2.12	2121.52÷860=$2.47
Derby Sr. High	5035.89÷1304=$3.86	4271.37÷1311=$3.26	4241.31÷1303=$3.26	5185.99÷1304=$3.98
El Paso Elem.	198.68÷251=$.79	313.99÷488=$.64	423.34÷524=$.81	386.35÷492=$.78
Oaklawn Elem.	707.57÷470=$1.50	697.30÷423=$1.65	753.48÷335=$2.25	1281.13÷369=$3.47
Pleasantview Elem.	334.29÷511=$.65	311.06÷519=$.60	332.21÷435=$.76	290.84÷374=$.78
Swaney Elem.	427.84÷356=$1.20	498.30÷400=$1.24	483.03÷370=$1.30	497.01÷386=$1.29
Wineteer Elem.	929.26÷509=$1.82	819.41÷472=$1.74	1486.64÷569=$2.61	1284.76÷532=$2.41
TOTAL*	11479.00÷5507=$2.08	10466.41÷5294=$1.98	11521.91÷5203=$2.21	13424.89÷5208=$2.58

*These totals are entire district total expenditure for water by year, therefore, may not reflect the sum of each column.

19

APPENDIX B

SCHOOL ENROLLMENTS:

	72-73	73-74	74-75	75-76
Carlton Jr. High	654	587	511	466
Cooper Elem.	430	444	384	398
Derby Elem.	341	-	-	-
Derby Jr. High	895	863	863	860
Derby Sr. High	1304	1311	1303	1304
El Paso Elem.	251	488	524	492
Oaklawn Elem.	470	423	335	369
Pleasantview Elem.	511	519	435	374
Swaney Elem.	356	400	370	386
Wineteer Elem.	509	472	569	532

Appendix C

ENERGY CHECK LIST

This check list is divided into four basic parts:

1. Building Condition
2. Equipment Condition
3. Heating, Ventilatin, Air Conditioning, Water/Gas Usage and Lighting Practices
4. Administrative Practices.

It is an instrument to serve only as a beginning to energy awareness and not as an absolute and comprehensive list. It is meant to be a device to stimulate in-depth inspection and critical thinking concerning various areas in the school which certain to energy and energy conservation.

It is suggested that detailed notes be taken as the team evaluates each building. It is further suggested that more than one "one the site" tour be made of each area.

School _____

BUILDING CONDITION:

Are there cracks in walls, floors, ceilings?

Do all windows and doors close properly?

Do all windows and outside doors have weather stripping?

Do double(air-lock) doors need to be installed?

Do windows need double-glazing of glass areas?

Should any doors or windows be replaced with new ones?

Should any doors or windows be completely eliminated?

Can shades, blinds or drapes be opened and closed properly?

Should awnings be used anywhere?

Could light-reflective colors be used in re-painting?

Do walls or roofs need insulating?

Are all heating and cooling sources clear of furniture, draperies, book-cases, files, etc?

Are there unnecessary heating and cooling devices?

Do air ducts need to be insulated?

Do water pipes need to be insulated?

School _____

EQUIPMENT CONDITION:

(Include equipment in the cafeteria, home economics, shop, laundry, commons, teachers' lounge, library and other special areas within the school)

Are maintenance procedures for equipment adequate?

Should some basic major equipment be over-hauled or replaced or eliminated?

Should some motors be replaced with ones of less horsepower?

Can any pumps, fans or motors be cut off on weekends, holidays, and/or nights?

Are all filters checked frequently?

Are the refreigeration unit's coils, fins and motors kept clean?

Is the heating equipment burning at maximum efficiency?

Are individual thermostats checked for accuracy?

Are lighting fixtures checked periodically?

Are light bulbs changed regularly?

Are all school vehicles including buses running efficiently?

Are all fuel storage areas in good repair?

School _____

HEATING, VENTILATING, AIR CONDITIONING, WATER/GAS USAGE AND LIGHTING PRACTICES:

Can the building warm-up cycle be started later in the morning?

Can heating controls be turned down sooner in the afternoon?

Can building temperatures be reduced during school?

Can building temperatures be reduced evenings, weekends and holidays?

Can unused rooms, halls, rest rooms, etc. have the heat or air conditioning drastically reduced?

Can the intake of fresh air into the heating system be reduced?

Can the start-up of the ventilating system be delayed until mid-morning when outside air is somewhat warmed?

Is cold water cleaning used wherever possible?

Can automatic shut-off devices be added to showers to help prevent water usage?

Can smaller volume shower heads be used?

Are leaky faucets reported and repaired promptly?

Can hot water temperatures be reduced to 120 degrees?

Can chilled water temperatures be raised to 55 degrees?

Can lights in halls, rest rooms and gyms be dimmed?

Can lights be turned out when classrooms are not in use?

Can lower candle power be used in some areas?

Can thermostats be enclosed so only custodial and maintenance staff can adjust them?

School _____

ADMINISTRATIVE PRACTICES:

Is energy conservation given high priority?

Are suggestions for ways to reduce energy encouraged?

Are teachers encouraged to add energy conservation to the curriculum?

Is adequate dress encouraged to accommodate lower temperatures?

Are extra-curricular events, meetings, conferences, etc. scheduled simultaneously to eliminate evening building usage?

Can weekend and evening use of facilities be reduced?

Can travel in school vehicles be reduced/restricted?

Can bus routes be organized more advantageously?

Can driver education car mileage be reduced?

Can more economical cars be used in driver education?

Can buses be changed to diesel power?

Can inter-school deliveries be cut down?

Can car pools be encouraged among school personnel?